

### REMARKS

Claims 1, 3-16, 18-19 are pending. Claims 1, 3-16, 18-19 are rejected.

Claims 1, 3-7, 9-12, 16 and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hansen et al. US 6,340,411 in view of Cook et al. U.S. 5,562,740 and further in view of Hatsuda et al. U.S. 6,562,879.

Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hansen et al. U.S. 6,340,411 in view of Cook et al. U.S. 5,562,740 and further in view of Smith et al. U.S. 2002/0090511 or Jewell U.S. 2003/0205342.

Claims 1, 5-8 and 10-15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over (renumbered) claims 1-9 and 11-12 in copending Application No. 10/748,977.

Claims 1, 5-8, 10-12 and 16-17 are provisionally rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-8 and 13 of copending Application No. 10/815,206.

Claims 1-8, 10, and 12-16 are rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-11 of copending Application No. 10/748,969.

#### The Rejection Of Claims 1, 3-7, 9-12, 16, 18 and 19 Under 35 U.S.C. 103(a)

Hansen et al. disclose both non polymeric and polymeric binders for binding particle to fibers and for densifying fibers without particles.. The non polymeric binders include for example, *polyols, polyamines, polyamides, polycarboxylic acids, polyaldehydes, amino alcohols and hydroxy acids*. Hansen et al. indicate that the organic non-polymeric binder is preferably selected from the group consisting of glycerine, a glycerine monoester, glyoxal, ascorbic acid, urea, glycine, pentaerythritol, a mono or disaccharide, citric acid, tartaric acid, taurine, p-aminosalicylic acid, dipropylene glycol and urea derivatives such as DMEDHEU, and combinations thereof, and various saccharides, column 4, line 27- line 58. Hansen et al. also state that densifying agents include organic polymeric and non- polymeric

binders. The preferred non- polymeric binders include sorbitol, glycerin, propylene glycol and mixtures thereof, column 59, line 18 - 32.

Hansen et al. state that specific types of binders that can crosslink are *polyols*, *polyaldehydes*, *polycarboxylic acids* and *polyamines* but when these crosslinking agents are used to make high bulk fibers that have intrafiber covalent crosslinks the binder will be consumed during the curing step to form covalently crosslinked bonds, column 34, line 1-13. Hansen et al. do not state that combinations of polyols, polyaldehydes, polycarboxylic acids and polyamines can be used for crosslinking. To prevent covalent bond formation, Hansen et al. state that in processes that *use polyols*, *polyaldehydes*, *polycarboxylic acids* and *polyamines*, the fibers should contain at least 20 % by weight water if the particles and binder are present in the fiber when curing occurs to inhibit covalent bond formation and prevent all the binder from being used to form covalent intrafiber crosslinks, column 34, line 20-28. Also in column 53, Example 32, lines 37-53, Hansen states that the binder can form covalent intrafiber crosslinks. *Polycarboxylic acids (such as citric acid )*, *polyols, (such as dipropylene glycol)* and *polyamines ( such as ethylene diamine)* can function as crosslinking agents and are consumed during the curing step in the formation of covalent crosslinks. Accordingly, in the limited case in which the crosslinking agent is also a binder, steps should be taken to prevent the binder from being consumed as a crosslinker in the curing step thus maintaining its binding ability. Stated in another way, crosslinking with the binder destroys the binder and makes it unavailable to bind the particles, the very object of the Hansen et al. reference and therefore the skilled artisan would not look to the Hansen et al. reference for crosslinking which makes his invention inoperative. Applicants submit that even in these situations where the binder may act as a crosslinking agent, Hansen et al. do not teach the combination of a crosslinking agent and a polyol in the intrafiber crosslinking reaction to arrive at the instant invention of Claim 1. Furthermore, Hansen et al. is only an invitation to virtual endless experimentation. Hansen et al. give no guidance to the skilled artisan as to which binders or combination of binders from the group of to select to achieve the instant invention. While Hansen et al. state that polyols, polyaldehydes, polycarboxylic acids and polyamines *can* crosslink, there is no guidance given as to

which genus or species within the genus, in combination, can crosslink to arrive at the instant invention. Thus the skilled artisan would be required to perform virtually endless experimentation to arrive at the instant invention. For example, of the 22 compounds listed in column 4, lines 52-60, 231 experiments would have to be conducted to determine which compounds crosslinked and further which combination of compounds would function to arrive at the claimed invention. This is based on the formula  $n! / (k! * (n-k)!)$  where  $n$  is the number of compounds, and  $k$  is the number in each combination, i.e. 2. Thus substituting the numbers the formula is  $22! / (2! * (22-2)!)$  or 231 experiments would have to be conducted to determine which compounds crosslink and which compounds, in combinations of two, would give the instant invention. If sorbitol, glycerin, propylene glycol, and mixtures thereof, mentioned in column 59, lines 30 and 31 were included for a total of 25 compounds and mixtures of the compounds then 300 experiments would have to be conducted to determine which compounds, in combination, could be used to arrive at the instant invention. Accordingly, there is no motivation to look to the Hansen et al. reference for the claimed invention.

While Hansen et al. state that polyols, and specifically dipropylene glycol, can form intrafiber crosslinks, and because sorbitol is a polyol, the Examiner concludes that all polyols crosslink with cellulose fibers. Applicants have shown that this is not true in the case of the sub genus acyclic polyols of which sorbitol and xylitol are species. The Examiner is requested to review the Declaration of Mr. Angel Stoyanov. Mr. Stoyanov states that an increase in FAQ wet bulk, relative to an untreated control, reflects that fibers have been crosslinked. As evidence, the Examiner is requested to review Table 1 of the Stoyanov Declaration. Here it is clearly shown that pulp alone, Sample A, has a FAQ wet bulk of 11.59 and Whiteness Index,  $WI_{(CDM-L)}$ , of 78.16. When pulp is treated with 2 % by dry weight sodium hypophosphite, FAQ wet bulk is 12.26 cc/g and  $WI_{(CDM-L)}$  is 77.87. When pulp is treated with citric acid and sodium hypophosphite, Sample C, the FAQ wet bulk is increased to 18.48 cc/g and the  $WI_{(CDM-L)}$ , is 68.69. When pulp is treated with citric acid, sodium hypophosphite and sorbitol, an acyclic polyol, at the 2 and 6 percent by weight level of sorbitol on pulp, Samples D and E, respectively, FAQ wet bulk is 18.29 and 17.05 cc/g, respectively, essentially the same as with sodium hypophosphite

and citric acid alone. The  $WI_{(CDM-L)}$  of Samples D and E, is increased to 78.71 and 81.30, respectively. However, when pulp is treated only with sodium hypophosphite and two different levels of sorbitol, 2 and 6 percent by weight, Samples H and I, there is no increase in FAQ wet bulk and indicative of no crosslinking with the cellulose;  $WI_{(CDM-L)}$  decreased relative to the control pulp and the pulp sample with only sodium hypophosphite, Samples A and B, respectively.

When pulp is treated with citric acid, sodium hypophosphite and xylitol, an acyclic polyol, at the 2 and 6 percent by weight level of xylitol on pulp, Samples F and G, respectively, FAQ wet bulk is 18.18 and 16.83 cc/g, respectively but at the 2 percent by weight addition level, is not different from only treating the pulp with citric acid and sodium hypophosphite, Sample C which has a FAQ wet bulk of 18.48. The  $WI_{(CDM-L)}$  of Samples F and G, also increased to 78.50 and 82.10, respectively. At the 6 percent addition level of xylitol, there is actually a reduction in FAQ wet bulk to 16.83 cc/g. However, when pulp is treated only with sodium hypophosphite and two different levels of xylitol, 2 and 6 percent by weight, Samples J and K, both FAQ wet bulk and  $WI_{(CDM-L)}$ , decreased relative to the control pulp and the pulp treated with only sodium hypophosphite, Samples A and B, respectively.

It is clear therefore that, contrary to the statements of Hansen et al., polyols, as shown by the species sorbitol and xylitol, do not crosslink with cellulose under the conditions of the instant invention and the results of reacting cellulose with a crosslinking agent in the presence of a polyol are new and unexpected. Applicants submit that it is not obvious to combine a crosslinking agent such as citric acid which crosslinks and has an adverse effect on color with a polyol such as sorbitol which Applicants have shown not to crosslink and not have any beneficial effect on color and yet arrive at crosslinked fibers with improved color.

Applicants submit that the Hansen et al. reference does not show wet bulk properties as claimed in the instant invention. Claim 1 states that the individualized intrafiber crosslinked cellulosic fibers are reacted with an effective amount of crosslinking agent in the presence of an effective amount of a  $C_4$ -  $C_{12}$  polyol to form intrafiber crosslinked cellulosic fibers which have a wet bulk greater than about 16 cc/g. That is, the fibers are reacted with a mixture of a crosslinking agent in the

presence of a polyol and the resulting fiber has a wet bulk greater than 16 cc/g. In contrast, Hansen et al. show the wet bulk of HBA, a high bulk intrafiber crosslinked fiber with a wet bulk of 19.4 cc/g and HBA fibers treated with glycerine, that is the glycerine is added *after* the intrafiber crosslinks are formed has a wet bulk of 16.1 cc/g. Accordingly Hansen et al. do not teach the bulk as claimed.

Hansen et al. also do not teach a Whiteness Index,  $WI_{(CDM-L)}$ , of greater than 69 and a brightness greater than 79.

Cook et al. teach bleaching of polycarboxylic acid crosslinked fibers to improve brightness and reduce odor but do not teach the use of a polyol during the crosslinking reaction to improve Whiteness Index, including the L value. The reference teaches a two step process, first crosslinking the cellulose fibers then bleaching to improve brightness and reduce odor. Cook only shows color and odor improvement by bleaching.

Hatsuda et al. teach water absorbent resins obtained by an aqueous solution polymerization step and then grinding the crosslinked polymer to obtain a bulk density of not less than 0.72 g/ml. Hatsuda et al. state that the L values of the resin has an L value of preferably not lower than 85 and gives actual L values of about 88, column 33, line 62. Applicant submit that the L values of greater than 94.5 claimed in the instant invention are new and unexpected for cellulose fibers crosslinked with a crosslinking agent in the presence of a polyol since polyols such as glycerol and pentaerythritol and cellulose can be used in the polymerization of the resin, column 7, line 4 and 36, respectively, and even with these present the L value is only about 88.

Hansen does not give guidance as to which binder species of the genus that is a polyol can be used as a crosslinking agent or which binder species that is a polycarboxylic acid can be used as a crosslinking agent, in combination with the polyol, to arrive at the instant invention thus requiring the skilled artisan to perform virtually endless experimentation. Furthermore, Hansen et al. state that a polyol, for example, sorbitol, can be used as a crosslinking agent yet the Applicants have proven that the subgenus acyclic polyols of which sorbitol and xylitol are each a species do not crosslink cellulose under the conditions of the instant invention. Applicants submit that it is not obvious to combine a crosslinking agent such as citric acid which crosslinks

with cellulose and has an adverse effect on color of the crosslinked fibers with a polyol such as sorbitol which Applicants have shown not to crosslink and not have any beneficial effect on color and yet arrive at crosslinked fibers with improved color. Also, the results are new and unexpected.

Hansen et al. discourage the use of binders in the crosslinking reaction since it destroys the binders use as densifying agent. Hansen et al. do not teach Whiteness Index greater than 69, brightness greater than 79 ISO, or a wet bulk greater than about 16 cc/g. Hansen et al. is only an invitation to endless experimentation. Cook does not teach the use of polyols during the crosslinking reaction and only teaches brightness improvement by bleaching. Hatsuda only shows L values in resins of about 88 even when polyols and cellulose are present in the polymer. In the instant invention L values are unexpectedly 94.5 or greater. Since there is no motivation to combine the references to make the claimed invention and the teachings of Hansen et al. for crosslinking with polyols are refuted in a Declaration showing polyols do not crosslink cellulose, all the elements of Claim 1 are not present in the combined references, and the results are new and unexpected, the claimed invention is nonobvious and patentable over the cited references.

Withdrawal of the rejection is respectfully requested.

Claims 7-9 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hansen et al. (6340411) in view of Cook et al. (5562470) and further in view of Smith et al., U.S. 2002/0090511 or Jewell U.S. 2003/0205342.

Claims 7-9 are dependent from Claim 1. Claim 1 has been addressed above. The fact that Jewell discloses citric acid, tartaric and / or malic acid as crosslinking agents for cellulose bears no further weight in showing obviousness since Hansen et al. does not show crosslinking cellulose with polycarboxylic acids in the presence of polyols, and specifically does not show a species of polycarboxylic acids in combination with a species of polyol which can be used to arrive at the instant invention. As mentioned earlier, Hansen et al. is only an invitation to endless experimentation. Hansen et al. does not show Whiteness, L values or wet bulk as in the instant invention. Cook does not suggest the use of a crosslinking agent in the presence of C<sub>4</sub>-C<sub>12</sub> polyols and uses a post treatment to achieve brightness. Jewell cites citric acid, tartaric acid, malic

acid, and others, as crosslinking agents but does not teach the use of polyols to achieve the Whiteness Index of the crosslinked fibers of the invention. Jewell et al. teach a composition comprising chemically crosslinked cellulose fiber and water borne binding agents, page 2, paragraph 21.

Smith et al. teach the use of completely bleached, partially bleached and unbleached fibers~but teach the desirability of using bleached pulp for its superior brightness and consumer appeal. The Smith et al. invention relates to the use of refining the cellulose fiber prior to crosslinking to achieve low median desorption pressures and improved fluid drainage in acquisition and / or distribution layers compared to similar unrefined fibers, page 3, paragraph 35 and page 3 and 4, paragraph 39. Smith et al. do not recognize the adverse effect on color as shown by Cook et al., US 5,562,740, when using, for example, citric acid, column 3, line 33- 38 and the need for improving color post crosslinking. Smith et al. do not teach crosslinking of cellulose in the presence of a polyol nor any fiber characteristics related to Whiteness Index. The list of crosslinking agents is extensive and does not teach crosslinking of cellulose in the presence of a polyol nor any fiber characteristics related to Whiteness index.

Applicants submit there is no suggestion or motivation to combine the references to arrive at the claimed invention in Claim 1. Furthermore, all the elements of Claim 1 are not in all the references even if they were combined. Withdrawal of the rejection is therefore respectfully requested.

#### Double Patenting Rejection

Claims 1, 5-8 and 10-15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over (renumbered) claims 1-9 and 11-12 in copending Application No. 10/748977.

Claims 1, 5-8, 10-12 and 16-17 are provisionally rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-8 and 13 of copending Application No. 10/815206.

Claims 1-8, 10, and 12-16 are rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-11 of copending Application No. 10/748969.


Applicants note the double patenting rejection and will file a terminal disclaimer on the notification of allowable subject matter.



CONCLUSION

Based on the remarks, the Examiner is respectfully requested to withdraw the rejection of the claims and to promptly allow the case and allow it to issue. If the Examiner has any further questions, he is invited to call the Applicant's Agent at the number listed below.

Respectfully submitted

A handwritten signature in black ink, appearing to read 'Unrau', with a large, stylized circular flourish on the left side.

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